

EXHIBIT 20

ZONOLITE
CONSTRUCTION PRODUCTS DIVISION

June 20, 1977

TO: ZONOLITE Regional Sales Organization
Mike Elliott/ZONO-Santa Ana (30)
Linda Lewis/ZONO-Park Ridge (35)
Pat Gowens/ZONO-Altamonte Springs (10)
Dean Stevens/ZONO-Atlanta (26)
Carolyn Stoeckel/ZONO-No. Brunswick (35)

PLEASE DISTRIBUTE TO REGIONAL MANAGERS, REGIONAL PRODUCT
MANAGERS, DISTRICT MANAGERS, AND SALESMEN.

cc: A. S. Clapperton
G. E. Hall
R. T. Frohlich
P. E. Korenberg
R. A. Merther
R. A. Wittgren
W. S. Zorkers
B. R. Williams
J. Wolter
W. R. Hanlon
E. S. Wood
R. M. Vining
R. C. Ericson
E. C. Trewhella
T. Pezzullo
W. R. Wright
L. W. Farmer/ZONO-South Gate
R. L. Junker/ZONO-Dallas
S. N. Mangino/ZONO-W. Chicago
J. M. Timmons/ZONO-Travelers Rest

SUBJ: Caution Statement on Vermiculite Product Bags
FROM: B. A. Blessington



C. W. G. C.

100

EXHIBIT 21

Draft

DECONY

MAR 27 1980

CPD, ENG.

CONFIDENTIAL LEGAL MEMORANDUM
(Attorney's Work Product)

RECD

March 27, 1980

APR 2 1980

CPD, ENG.

TO: E. S. Wood

FROM: O. M. Favorito

cc: R. M. Vining
F. W. Eaton
D. C. Evans

WOF CP

Re: Asbestos in Consumer Products

Enclosed herewith is a draft of a letter to Dale Ray of the Consumer Product Safety Commission following up on our telephone conversation with him on March 12, 1980. The letter incorporates the steps taken by CPD to reduce user asbestos fiber exposure to the maximum extent feasible as detailed by your memorandum of March 24. I would appreciate comments by all recipients of the letter as soon as possible. I specifically call Fred Eaton's attention to Annex A which I have edited from prior versions and to Note 1 on page 7 of Annex A to the letter which requires explanation of the South Carolina data results for tests A(1)(a) and A(2)(a).

You will note that the letter makes no reference to the caution label which has been placed on the Zonolite attic insulation bags as well as those placed on the Terra-Lite vermiculite and Redi-Earth bags. My reason for omitting reference to the caution labels is that I have doubts as to whether the caution labels are very helpful to our case.

The data which we are submitting to CPSC acknowledges the fact of asbestos fiber emissions from attic insulation during installation. The caution label used on attic insulation does not specifically identify asbestos and, accordingly, could be viewed by the CPSC as being inadequate warning of the risks which may be associated with use of this product. The warning label states:

E. S. Wood

- 2 -

March 27, 1980

CAUTION

Avoid Creating Dust

Breathing Dust may be Harmful to your Health

Use with Adequate Ventilation,

or with Respiratory Protection

I recognize that the caution label was placed on the bag out of a genuine desire by CPD to alert users to a potential hazard, and that if users did avoid breathing dust they most likely would avoid breathing any asbestos fibers. Therefore, the warning would have accomplished its purpose of mitigating user exposure to asbestos fibers which might be present in attic insulation. I also recognize that it is CPD's belief that the fiber exposure associated with reasonably foreseeable use of attic insulation does not present any unreasonable risk to the user given that exposure to asbestos fibers which have been measured are at extremely low levels for short periods of time and represent only a two or three time total lifetime exposure.

Nevertheless, CPD should consider revision of the caution label to specifically identify the possibility of asbestos fiber exposure and to identify more specifically the type of respiratory protection required when installing attic insulation. According to Harry Eschenbach, the prescribed form of dust mask necessary to be utilized where asbestos fibers are present is a type of mask which is for use in preventing pneumoconiosis.

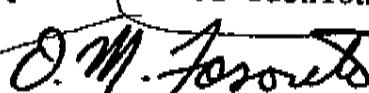
The caution label presently being used on Terra-Lite vermiculite and Redi-Earth packages reads as follows:

CAUTION

Avoid Breathing Dust by Premoistening
or Using with Adequate Ventilation

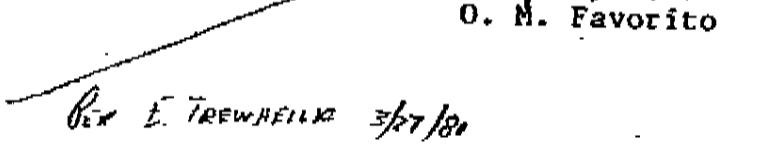
Breathing Dust may be Harmful
to your Health

This label should be reviewed as should the desirability of placing a caution label on the product Pool Cushion.



O. M. Favorito

OMF/MS
Enclosure



E. S. Wood 3/7/80

DRAFT
3-26-80

TO OMF
COPY TO ESW

ED TEEUWEN REQUIRES
DUST MASK IS ON ROLL CUSHION
BUT IS CHECKING K/SUMMER
K/W ADVISE.

JZ
3/28/80

Mr. Dale Ray
Consumer Product Safety Commission
Economic Program Analysis Division
Room 656-B
Washington, D.C. 20207

Dear Mr. Ray:

Reference is made to our conference call of March 12, 1980 in which we reviewed with you the results of W. R. Grace & Co.'s (Grace) testing to determine the extent of asbestosiform tremolite fiber release associated with use of Grace vermiculite in consumer products. During our conversation you requested that we set out the details of Grace's fiber exposure test methodology and test results and indicate the extent of Grace's fiber reduction efforts.

As you know, tremolite is a tramp mineral contaminant which is associated with vermiculite and which Grace has been attempting to reduce to the maximum extent feasible. Since 1970 Grace has expended capital costs in excess of \$15 million relating to extraction of worthless materials and contamination and/or airborne fiber reductions in its vermiculite mining, milling, and expanding operations. A substantial part of these capital costs was associated with the construction by Grace of a new vermiculite mill at its Libby, Montana mine which uses wet screening and other wet ore recovery processes designed to reduce the asbestosiform tremolite contaminant associated with vermiculite.

Subsequent to the new mill's coming on stream in early 1975, Grace took further steps to remove fine particles containing contamination from the vermiculite ore concentrate and to prevent such particles from being recycled into the ore concentrate. Contemporaneously with the contaminant removal steps taken at the mine, changes were made in the exfoliation process equipment used at Grace's vermiculite expanding plants which process Grace vermiculite ore for use in both consumer and industrial products. These changes provided for further screening, separation, and removal of heavier unexpanded residual high density material which may contain asbestosiform tremolite contaminant. Also, by use of bag houses and other dust and filter removal equipment additional reduction of the tremolite fiber contamination of expanded vermiculite end product is accomplished.

A BAG HOUSE IS ON. A FILTER DEVICE, STATEMENT INCORRECT

DELETE

Mr. Dale Ray

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Because of our concern over exposure to asbestosiform fibers, Grace has taken the further step, with regard to its Zonolite(R) attic insulation product, of adding a binding wetting agent to further reduce dust and exposure to asbestosiform fibers during installation of this product.

The foregoing efforts to reduce asbestosiform tremolite contamination to the maximum extent feasible have resulted in consumer products containing Grace vermiculite which in reasonably foreseeable use do not generate unreasonable risks for users. This has been verified by Grace's fiber exposure tests of consumer products containing expanded Grace vermiculite ore. All measurements were made by the NIOSH-approved technique as set forth in 40 CFR §1910.1001, paragraphs (e) and (f), utilizing the membrane filter method at 400-450 X (magnification) (4 millimeter objective) with phase contrast illumination. The results of these tests were as follows:

<u>Product</u>	<u>Fibers Detected</u>
Terra-Lite(R) Vermiculite	None detected
Redi-Earth(R)	None detected
Lightweight Fertilizer (Scott's Turf Builder)	None detected
Zonolite Attic Insulation	Some fibers detected during installation

The actual test protocols and results of the tests are set forth in Annex A to this letter. No tests were performed on Grace's product Pool Cushion(R) which is used for protection of the base of vinyl-lined above ground swimming pools since this use is carried on out-of-doors and, typically, involves use of no more than 3-12 bags of vermiculite, depending on the size of the pool.

As noted, the only Grace product in respect of which fibers were detected was the Zonolite attic insulation product and this was at very low levels and only during installation. Since this product is unlikely to be used more than two or three times during an entire lifetime and then only for exposure times which would not be expected to exceed two hours in any one case, the lifetime dosage is many orders of magnitude lower than any promulgated government standard applicable to tremolite fiber emission exposure.

DELETE

Mr. Dale Ray

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MIL

Nevertheless, Grace is continuing to exert its best efforts to reduce even further the asbestosiform tremolite contamination associated with its vermiculite products to the maximum extent feasible. To this end Grace expects by May of this year to have operational a new rock rejection circuit at its Libby ~~mine~~. This circuit is expected to reduce the level of tremolite contamination in vermiculite ore associated with fine size vermiculite ore by 50%. Additional research is under way in developing a similar circuit for reduction of the level of tremolite contamination associated with the coarser sizes of vermiculite of the kind used in Zonolite attic insulation. A promising separation technique which we are looking into is slot screening which, if successful, could also reduce tremolite contamination by over 50% in these coarse sizes of ore.

You must note, however, that the amount of asbestosiform tremolite contaminant in the vermiculite ore presently shipped to the processing plants already is in an average approximate range of 1/2 of 1% on a dry weight basis. For expanded vermiculite products the level of contaminant is on average at or below the lowest level of reliable detectability, which for tremolite contamination of vermiculite is 2/10ths of 1% on a dry weight basis.

Accordingly, the 50% reduction Grace expects to achieve in the fine and later the coarse vermiculite ore sizes is a reduction from already very low contaminant levels. In this context you must understand that the task of further reducing the remaining residual contamination in unexpanded and expanded vermiculite ore has by its nature become proportionately more difficult when compared to the significant results obtained to date.

We trust that the information contained herein will be useful to you in connection with the CPSC's evaluation of the asbestos contamination issue.

Very truly yours,

E. S. Wood
Executive Vice President

Attachment

ANNEX A

USER EXPOSURE TO FIBROUS TREMOLITE
IN VERMICULITE CONSUMER PRODUCTS

TEST DATA

I. TEST PROTOCOL

A. Horticultural Products

1. Modes of Consumer Home Use Of Terra-Lite(R) Vermiculite(a)

(a) Mix and fill pots to simulate consumer preparation of a mix of 50% peat moss and 50% Terra-Lite by scooping equal volumes of materials out of separate packages and depositing on work surface. Hand mix to reasonable uniformity and fill fifteen (15) 4" diameter flower pots in 15 minutes. Press down to firm up the soil to hold the plant. The 15 dried out pots were then brought into the work area where three separate procedures were performed. Fiber counts were taken during each of these three procedures. Five pots were used for each of the three procedures..

(b) Knock Out and Disposal - To simulate the consumer who does not intend to reuse the soil. Invert the pot and rap on the working surface so that the soil drops out. Brush the mound of soil off the bench into a disposal container. Take a paper towel and wipe inside of pot so that it is clean for reuse and dispose of the paper towel. In this procedure, contents of five pots will be disposed of during the 15 minute test period.

(c) Knock Out and Reuse for Potting Other Plants -

Simulate a consumer who will reuse the potting soil. Wrap pot on work bench by hand and break up the lump of soil to make it similar to its original free-flowing condition. Repeat this five times. Combine all soil into one pile; then proceed to refill pots by scooping the material back in and tamping it down. In this 15 minute test procedure, five pots will be filled.

(d) Knock Out and Blend with New Potting Soil -

Simulate a consumer who will blend old with new potting soil. Wrap pot on work bench by hand and break up the lump of soil to make it similar to its original free-flowing condition. Repeat procedure five times. Obtain additional potting soil to replace the volume of the dried soil disposed of. Place new soil on top of the old soil and mix together by hand. Use this mix to fill pots. During this 15 minute test procedure, 10 pots are filled.

2. Consumer Use of Redi-Earth(R)

(a) Same procedure as 1 (a) Terra-Lite Vermiculite except substitute pre mixed Redi-Earth(b) as the soil medium.

(b) Same procedure as 1 (b) Terra-Lite Vermiculite

(c) Same procedure as 1 (c) Terra-Lite Vermiculite

(d) Same procedure as 1 (d) Terra-Lite Vermiculite

B. Application of Lightweight Fertilizer(c)

1. GENERAL

A five building apartment complex was selected as the test site. With over 100,000 sq. ft. of grass area, the site allowed air sampling while fertilizing over an extended period of time.

The tests were conducted with two people: one filling spreader hopper and fertilizing, and the other maintaining log sheets, time and pump calibration.

2. Application of Lightweight Lawn Fertilizer

Two sampling pumps with filter cassettes located in the left and right breathing zones were worn by the applicator during the sampling/fertilizing period. The applicator filled the spreader hopper to within 2" of the top and refilled when the hopper was approximately 3/4ths empty. Using a new Model 35 Scotts spreader with guide markers, the applicator spread thirteen (13) bags of lawn fertilizer at the normal coverage application rate (5000 ft²/bag).

C. Home Installation of Vermiculite Attic Insulation(d)

1. General

Vermiculite Loose Fill attic insulation is generally purchased in quantities of 10-100 bags per home to "retrofit" or "add to" existing insulation in an existing home. Seldom is vermiculite loose fill installed in new

construction. To determine consumer exposure to tremolite fibers, the following series of tests by home owners were intended to indicate actual exposures under a variety of conditions.

2. Area Engineering Samples

Engineering samples were taken as follows:

(a). Prior to installing vermiculite attic insulation, monitor attic space for 5-6 hours.

(b). Approximately two months after installing insulation, monitor attic space for 5-6 hours.

3. Pouring/Leveling Vermiculite Loose Fill in Attic

Each test home utilized 40-70, 3 cf bags of vermiculite attic insulation. The installer was monitored during the placement of insulation.

Initially, place 15-20, 3 cf bags in the attic. The installer poured all bags and levelled insulation with a wooden hand screed or one with a handle to push insulation back into roof eaves. Additional bags were brought to the attic in lots of 15-20 bags as required.

NOTES:

- (a) Terra-Lite vermiculite is composed of Grace vermiculite size #3 ore from either Libby, Montana or Enoree, South Carolina.

NOTES: (cont'd)

- (b) Redi-Earth is basically a combination of 50% peat moss and 50% vermiculite size #3 ore from either Libby, Montana or Enoree, South Carolina with plant nutrients added.
- (c) Lightweight fertilizer utilizes vermiculite size #4 ore from either Libby, Montana or Enoree, South Carolina.
- (d) Attic insulation is composed primarily of Grace vermiculite size #1 or #2 ore from Libby, Montana.
- (e) Pool Cushion which was not tested utilizes vermiculite size #3 ore from either Libby, Montana or Enoree, South Carolina.

II. RESULTS (See notes 1 and 2)

	<u>TEST DESCRIPTION</u>	<u>PERSONNEL AVE. EXPOSURE (f/cc)</u>	<u>PERSONNEL TWA EXPOSURE (f/cc)</u>
A.	<u>HORTICULTURAL PRODUCTS</u>		
1.	<u>Consumer Use of Terra-Lite Vermiculite</u>		
✓(a)	<u>Mix and Fill Pots</u>		
	South Carolina	<0.29(See note 1)	<0.073
	Montana	<0.14	<0.035
(b)	<u>Knock Out and Disposal</u>		
	South Carolina	<0.14	<0.035
	Montana	<0.14	<0.035
(c)	<u>Knock Out and Reuse</u>		
	South Carolina	<0.14	<0.035
	Montana	<0.14	<0.035
(d)	<u>Knock Out and Blend</u>		
	South Carolina	<0.14	<0.035
	Montana	<0.14	<0.035
2	<u>Consumer Use of Redi-Earth</u>		
✓(a)	<u>Mix and Fill Pots</u>		
	South Carolina	40.29	0.036
	Montana	0.145(See note 1)	<0.035
(b)	<u>Knock Out and Dispose</u>		
	South Carolina	<0.14	<0.035
	Montana	<0.14	<0.035
(c)	<u>Knock Out and Reuse</u>		
	South Carolina	<0.14	<0.035
	Montana	<0.14	<0.035
(d)	<u>Knock Out and Mix With New Soil</u>		
	South Carolina	<0.14	<0.035
	Montana	<0.14	<0.035
B.	<u>LIGHTWEIGHT FERTILIZER</u>		
1.	<u>Application of Lightweight Fertilizer With Montana derived vermiculite</u>	<0.03	<0.008

ON THE SAMPLING DATA SHEET (ORIG.) ONE SAMPLE RESULT WAS 0.29 AND THE OTHER 40.29.⁶ WITH THESE VALUES OUR RESULTS WOULD BE C. 145. HOWEVER IN REVIEWING LAB WORK SHEETS, NO FIBERS WERE OBSERVED IN EITHER SAMPLE. THIS WAS A COMPUTING ERROR

C. Home Installation of Vermiculite Attic Insulation

1. Engineering/Area Samples

<u>Home</u>	<u>Type Home</u>	<u>No. Bags</u>	<u>Fiber Concentration (f/cc)</u>	<u>After</u> (see note 3)
			<u>Attic</u>	
F	Colonial	55	0.03 (see note 4)	<0.01
N	Cape	30	NO TEST	<0.01
S	Ranch	64	<0.01	<0.01
W	Colonial	70	<0.01	<0.01

2. Installer Personnel Samples

<u>Home</u>	<u>Type Home</u>	<u>Personnel Exposure (f/cc)</u>	
		<u>Ave</u>	<u>TWA</u> (see note 2)
F	Colonial	2.597	0.649
N	Cape	0.971	0.243
S	Ranch	2.115	0.529
W	Colonial	1.746	0.436

NOTES:

- The symbol < (less than) indicates no fibers were observed in the counted fields. However, for conservatism, it is Grace's practice not to report zero (0) f/cc, and one (1) fiber is "plugged into" the analysis calculations. The < symbol clarifies the quantitative value and indicates no fibers were observed in the counted fields.
- [Explain South Carolina data results for A(1)(a) and A(2)(a).] *HP on P-8* *JZ*

Each test of horticultural products was repeated using vermiculite ore from each of Grace's mining locations, viz., Libby, Montana and Enoree, South Carolina. The vermiculite ore used in attic insulation originates from the Libby, Montana mine as does that purchased by O. M. Scott from Grace for use in its lightweight lawn fertilizer.

NOTES: (cont'd)

2. In calculating the time weighted average (TWA) for attic insulation, it is assumed the installer or home owner would work in the attic pouring vermiculite loose fill two hours in one 8-hour work day. Although TWAs apply to industrial work exposure, TWAs overstate consumer exposure to fibrous forms of tremolite containment. TWAs are used as a life time average exposure taking into consideration all phases of the working environment. In the case of a consumer pouring vermiculite attic insulation, this is a one or two time limited exposure.
3. In addition to results tabulated, two additional tests indicate no fibers detected in attics insulated with vermiculite loose fill six hours and approximately nine years after installation.
4. In all home attics tested, vermiculite attic insulation was added as a retrofit insulation over existing glass, mineral wool or cellulose insulation. In home "F" a fiber was observed in the counted fields prior to pouring vermiculite attic insulation. Although length and aspect ratio fell within the fiber definition, it is believed it was airborne glass fiber from existing insulation.

March 26, 1980

THE BASIC FORMULA FOR CALCULATING FIBER CONCENTRATION (f/cc)

IS $\frac{\text{NO. FIELDS COUNTED} \times \text{CONSTANT}}{\text{TOTAL AIR VOLUME SAMPLED}}$ THEREFORE, QUANTITATIVE VALUES

VARY AS A RESULT OF THE - 8 - NUMBER OF FIELDS COUNTED AND/OR
TOTAL AIR VOLUME SAMPLED, WITH EXCEPTION OF MIXING AND FILLING
POTS WITH SO-CAROLINA DERIVED VERMICULITE (A-1-a & A-2-a),
100 FIELDS WERE COUNTED, ONLY 50 FIELDS WERE COUNTED IN
TEST ITEM A-1-a AND 17-2-a.

EXHIBIT 22

BINDER DEVELOPMENT PROGRAM

This memo is a general discussion of some aspects of the Binder Development Program. It covers the areas of background, binder objectives, trials and testing.

I. BACKGROUND

The current OSHA Standard requires product labeling where a manufacturing plant is found to have employee exposures to airborne fiber concentrations in excess of the current tolerance level. Following an OSHA inspection in January, 1976 of the Omaha expanding plant we are now under citation for not labeling our product. We have until December 30, 1976 to either bring the Omaha plant fiber concentrations below the tolerance level, show why we should not label the product, or commence labeling of product.

It is believed that product labeling would have a serious, adverse, and irreversible effect upon customer acceptance of our products. The current OSHA Standard specifies that OSHA will accept the addition of a binder as being one method of removing the product labeling requirement. It is understood that OSHA will also accept data from six sampling of representative product usage if that data shows user exposures below current tolerance levels. It is possible that binder modifications might be made part of the standard formula for some products, irrespective of OSHA labeling requirements.

II. OBJECTIVES

Accordingly, the overall objective of the binder program is to have working binders and the equipment for their application on hand and usable with Libby products which may need them before the end of this year. Initial Libby product focus will be on Masonry Fill followed by straight #2 (attic fill, professional horticultural, and industrial). Beyond this very general objective, it is possible to list a number of more specific, working objectives in binder development. The following list of objectives is idealized; all may not be attainable, some may prove mutually exclusive.

1. Binder must be sufficiently effective in use to put airborne fiber concentrations under the tolerance level in representative jobsite conditions.

2. Binder and its delivery system should pose no appreciable equipment complexity for the expanding plant, and successful binder application should be relatively insensitive to mis-settings of equipment controls. Ideally, the delivery equipment would either already exist (asphalt/silicone sprays for MF) or be simple to add.
3. Binder itself not be a carcinogen or pose other hazards such as flammability, either by itself or in its foreseeable storage, handling, application to the product, and use of the product.
4. Binder(s) not appreciably interfere with free pouring and dispersion.
5. Product with binder have a shelf life of not less than three months before decline in binder's effectiveness (if any decline).
6. Product with binder be non-reactive with kraft or polyethylene packaging or with water.
7. Least cost — a current increase of less than 10¢ per bag, applied. If this objective cannot be met, the least cost working binder must still be developed.
8. Binder(s) should not be "esoteric", preferably would not be subject to wide price swings, be locally available, and be stable in storage.
9. Binder(s) not have adverse effect on water repellency where required (such as masonry fill) or on water mixability where required (such as Zonolite Concrete or Monokote).
10. Binder used for horticultural applications should not interact with other soil ingredients.

III. TRIALS

Trials are to start in Trenton with Masonry Fill. Trenton was picked for large size, variety of furnace types, Libby ore usage and proximity to Cambridge. Plant costs related to trials will be charged to their development account. Masonry Fill was selected as the first product because it is already made with binders and plants have application equipment installed.

It is anticipated that the plant trials sequence will approximate the following:

1. Standards Establishment

- a. Adjustment to standard operating conditions per current product formula.
- b. One pound sample taken of ore concentrate going to furnace for subsequent Cambridge quantitative analysis.
- c. Representative employee air sampling for fiber count or other contaminant while standard product is running.
- d. Representative engineering air sampling for fiber count or other contaminant may also be done if there are points of interaction.
- e. Bagging off of marked standard samples for subsequent Cambridge quantitative analysis and air sampling analysis (approximately 10 bags).

2. Trial

- a. Trial formula with binder is believed "make-able", preferably has already been tried on a small scale. (Trial formulas previously communicated to plant manager.)
 - b. Adjustment of operating conditions to trial formula.
 - c. When process appears stabilized at trial formula,
 - d. Repeat employee air sampling,
 - e. Repeat engineering air sampling, if any. (Note: These samples will be marked "experimental" to prevent confusion with samples representative of a plant running standard product formulas.)
 - f. Bagging off of marked experimental samples for subsequent Cambridge air sampling analysis (approximately 10 bags).
3. Proceed with subsequent trials of other trial formulas, if any (repeat #2 above).
 4. At end of trials on this combination of product and equipment:
 - a. Resume operating conditions to current product formula.
 - b. One pound sample of ore taken.

5. Assumptions

- a. At this point, it is assumed plant and equipment are back at normal.
- b. It is also assumed that all the product run and bagged during trials which was not destined to be shipped to Cambridge is usable for the intended product application. If so, it will be put into inventory for subsequent sale through normal channels but to only one job site or customer.
- c. Plant will make copy of applicable invoice and mail to Cambridge.
- d. Cambridge will follow-up with customer to see whether comments are volunteered.

IV. TESTING

This section concerns the Cambridge testing of ore concentrate, standard formula product, and trial formula products samples taken under Section III, TRIALS, above.

The one pound ore concentrate samples will be saved for possible quantitative analysis, as needed, so as to determine tremolite content of the Libby ore at that plant used on the day of trials, if necessary. Variations in ore concentrate tremolite content might affect expanded product release of fibers. These samples are taken to facilitate comparisons between trials taken on different dates if necessary. Two samples are taken to address the possibility that ore concentrate use during a trial might have bridged the "dividing line" between two different carloads in the silo. These samples would also add to our general knowledge concerning variables of tremolite content in Libby ore. It is noted that we are concerned not with total tremolite, but non-asbestos tremolite, asbestosiform non-airborne tremolite, and asbestosiform tremolite which could be airborne.

The one pound sample of expanded product, under current formula, will similarly be saved for possible quantitative analysis. There are two intents. First, to add to our general knowledge of tremolite content in expanded product compared directly to the ore concentrate from which it was made. Second, to again facilitate comparisons between different trials taken on different dates, same as intent of ore concentrate samples.

The employee (and engineering) air samples would be for two purposes. First, making sure the trial formulas do not adversely affect plant working environment in some unforeseen way. Second, assuming that the binder usage lowers airborne fiber concentration in the plant, to obtain a preliminary indication of how much. It is conceivable that binder utilization might serve as back-up for dust pick-ups.

The air sampling of standard formula product and trial product is for purposes of assessing the concentrations of airborne fibers released when the product is dumped or poured. Air sampling to date of product use, both actual or jobsite and simulated, has served to indicate which products may pose problems under some conditions. A problem, however, with job site testing is that the test conditions can vary a great deal. It would be unfortunate to draw conclusions about various binders' effectiveness versus standard formula if the data reflected much influence from varying test conditions.

Accordingly, a test facility will be set up here in Cambridge so as to test all trial (and standard formula for comparison) material under relatively controlled conditions. Test facility fiber counts will not necessarily duplicate fiber counts on any specific job site. However, we now know representative ranges of fiber counts on job site for some products. It is assumed that a trial formulation with binder which performed favorably versus standard formula in the test facility would be expected to do so in the field, too. Once one binder formulation has been found which yielded the order of magnitude improvement sought in the test facility, that would be verified on job site.

1. The characteristics of the test facility would be as follows:
 - a. Inside and enclosed, little draft, "closable"
 - b. minimum floor area approximately 250 sq. ft.
 - c. minimum bay height 8 to 12 feet
 - d. adjacent storage area for bagged goods
2. General equipment would include:
 - a. elevated hopper capable of holding a minimum of 5 bags
 - b. step ladder
 - c. an adjustable discharge duct which would be adjusted to approximately 1 to 3 cu. ft./minute rate
 - d. unrestricted drop of 4 to 5 feet into
 - e. movable dumpster beneath with provision to pour used material into disposal bags
 - f. cannister type shop vacuum approved for fiber retention
 - g. ideally, a means of exhaust fan ventilation of test facility after test
3. Test equipment would include:
 - a. two air pumps mounted on pipe stands approximately one foot from material stream set about 180° from each other
 - b. one pump mounted on a pipe stand approximately 3 feet from material stream set at midpoint from other two pumps and down-wind (if there is any)
 - c. the intent would be to have no air currents in test facility but there probably will be
4. Test procedure (with personnel wearing NIOSH approved respirators in area of test facility)
 - a. vacuum facility with cannister in it
 - b. wait five minutes
 - c. take one 15 minute background air sample at remote pipe stand 3-b (above)
 - d. load hopper from bags attempting to minimize dust creation

- e. activate 3 pumps, commence material discharge, leave test facility and close door
- f. at end of material discharge, terminate above 3 samples
- g. take one 15 minute air sample at remote pipe stand, (door closed)
- h. terminating above sample, leave door open and activate exhaust fan until visible dust gone
- i. dispose of test material and vacuum test facility, retaining other half (5 bags) of trial material until after fiber counts have been taken

V. ANALYSIS OF SAMPLES

1. Ore Samples

- a. All samples will be examined by X-ray diffraction to determine presence or absence of tremolite.
- b. If appropriate interest and time develops, the X-ray diffraction pattern will be examined more closely and a quantitative determination of total tremolite will be made.

2. Expanded Samples

Same as 1 above.

3. Air Samples

All will be tested by the NIOSH approved procedure for the analysis of airborne fibers.

R. H. Locke

5/17/76

(revised to H. A. Brown comments 5/11/76 and H. C. Duecker comments 5/12/76)



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Current Best Practices for Vermiculite Attic Insulation - May 2003

The U.S. Environmental Protection Agency (EPA) offices have received a large number of phone calls from citizens concerned about vermiculite insulation in their home that might be contaminated with asbestos. EPA is gathering more information about vermiculite insulation and other products containing vermiculite. If you suspect vermiculite insulation is in your home, the safest thing is to leave the material alone. If you decide to remove or must otherwise disturb the material due to a renovation project, consult with an experienced asbestos contractor. The following information provides a common-sense approach to help you find out what kind of insulation is in your home and decide what to do if you have vermiculite insulation.

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What is vermiculite insulation?

Vermiculite is a naturally occurring mineral that has the unusual property of expanding into worm-like accordion shaped pieces when heated. The expanded vermiculite is a light-weight, fire-resistant, absorbent, and odorless material. These properties allow vermiculite to be used to make numerous products, including attic insulation.

Do I have vermiculite insulation?

Vermiculite can be purchased in various forms for various uses. Sizes of vermiculite products range from very fine particles to large (coarse) pieces nearly an inch long. Vermiculite attic insulation is a pebble-like, pour-in product and is usually light-brown or gold in color. The pictures below show several samples of vermiculite attic insulation.

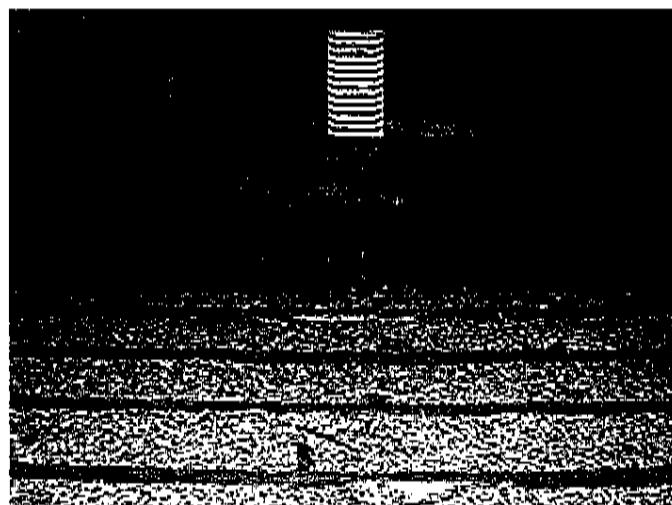
Photo - Different Grades of Vermiculite -



Photo - Close Up of Vermiculite Insulation in an Attic -



Photo - Attic Containing Vermiculite Insulation -



Is vermiculite insulation a problem?

Prior to its close in 1990, much of the world's supply of vermiculite came from a mine near Libby, Montana. This mine had a natural deposit of asbestos which resulted in the vermiculite being contaminated with asbestos. Attic insulation produced using vermiculite ore, particularly ore that originated from the Libby mine, may contain asbestos fibers. Today, vermiculite is mined at three U.S. facilities and in other countries which have low levels of contamination in the finished

material.

How does asbestos cause health problems?

Asbestos can cause health problems when inhaled into the lungs. If products containing asbestos are disturbed, thin, lightweight asbestos fibers are released into the air. Persons breathing the air may breathe in asbestos fibers. Continued exposure increases the amount of fibers that remain in the lung. Fibers embedded in lung tissue over time may result in lung diseases such as asbestosis, lung cancer, or mesothelioma. Smoking increases your risk of developing illness from asbestos exposure.

What should I do if I have vermiculite attic insulation?

DO NOT DISTURB IT. Any disturbance has the potential to release asbestos fibers into the air. Limiting the number of trips you make to your attic and shortening the length of those trips can help limit your potential exposure. EPA and ATSDR strongly recommend that:

- Vermiculite insulation be left undisturbed in your attic. Due to the uncertainties with existing testing techniques, it is best to assume that the material may contain asbestos.
- You should not store boxes or other items in your attic if retrieving the material will disturb the insulation.
- Children should not be allowed to play in an attic with open areas of vermiculite insulation.
- If you plan to remodel or conduct renovations that would disturb the vermiculite, hire professionals trained and certified to handle asbestos to safely remove the material.
- You should never attempt to remove the insulation yourself. Hire professionals trained and certified to safely remove the material.

What if I occasionally have to go into my attic?

EPA and ATSDR strongly recommend that homeowners make every effort not to disturb vermiculite insulation in their attics. If you occasionally have to go into your attic, current best practices state you should:

1. Make every effort to stay on the floored part of your attic and to not disturb the insulation.
2. If you must perform activities that may disturb the attic insulation such as moving boxes (or other materials), do so as gently as possible to minimize the disturbance.
3. Leave the attic immediately after the disturbance.
4. If you need work done in your attic such as the installation of cable or utility lines, hire trained and certified professionals who can safely do the work.
5. It is possible that vermiculite attic insulation can sift through cracks in the ceiling, around light fixtures, or around ceiling fans. You can prevent this by sealing the cracks and holes that insulation could pass through.
6. Common dust masks are not effective against asbestos fibers. For

information on the requirements for wearing a respirator mask, visit the following OSHA website: <http://www.osha-slc.gov/SLTC/respiratoryprotection/index.html>

What are the next steps?

The guidance provided in this brochure reflects the current testing technology and knowledge of precautions one may take regarding vermiculite attic insulation. EPA is initiating further studies on vermiculite attic insulation and pursuing other asbestos related issues. Additional information will be provided to the public via the EPA and ATSDR web sites and through additional outreach materials as it becomes available.

Is my health at risk from previous exposures to the asbestos in the insulation?

If you removed or disturbed the insulation, it is possible that you inhaled some asbestos fibers. Also the disturbance may have resulted in the fibers being deposited into other areas of the home. Exposure to asbestos increases your risk of developing lung disease. That risk is made worse by smoking. In general, the greater the exposure to asbestos, the greater the chance of developing harmful health effects. Disease symptoms may take several years to develop following exposure. If you are concerned about possible exposure, consult a physician who specializes in lung diseases (pulmonologist). Where can I get information on testing or removal of the insulation? EPA and ATSDR strongly recommend using a trained and certified professional to conduct removal work. Removing the insulation yourself could potentially spread asbestos fibers throughout your home, putting you and your family at risk of inhaling these fibers. For certified asbestos removal professionals in your area, refer to your local Yellow Pages. Your State Environmental Agency can confirm that the company's credentials are current. You can find your State Agency at: <http://www.epa.gov/epahome/wherelyoulive.htm>. Currently, there are specific technical issues involving vermiculite sampling that can complicate testing for the presence of asbestos fibers and interpreting the risk from exposure. EPA and ATSDR are not recommending at this time that homeowners have vermiculite attic insulation tested for asbestos. As testing techniques are refined, EPA and ATSDR will provide information to the public on the benefits of testing that produce more definitive and accurate test results.

What if I have work-related exposure to vermiculite?

Workers who have had significant past exposure, or have significant ongoing exposure to asbestos, to vermiculite from Libby, or to other asbestos contaminated materials should consider getting a medical exam from a physician who knows about diseases caused by asbestos. For more information and to obtain a fact sheet concerning occupational exposure to vermiculite, contact the National Institute for Occupational Safety and Health (NIOSH) at: 1-800-35-NIOSH, or <http://www.cdc.gov/niosh/homepage.html>.

Where can I get more information?

Information on the Agency's guidance on asbestos and vermiculite, including insulation and horticultural products, has previously been available on EPA's website. Additional information on vermiculite and asbestos is available from the following sources:

General

EPA's Toxic Substances Control Act (TSCA)

<http://www.epa.gov/opptintr/asbestos/insulation.html>

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Information	Assistance Information Service: Asbestos Line: 1-800-471-7127 EPA Asbestos Ombudsman: 1-800-368-5888 EPA's Asbestos Home Page: http://www.epa.gov/asbestos/
Health Information	Agency for Toxic Substances and Disease Registry (ATSDR): http://www.atsdr.cdc.gov
Worker Safety	Occupational Safety and Health Administration (OSHA): http://www.osha.gov
	National Institute for Occupational Safety and Health (NIOSH): http://www.cdc.gov/niosh/homepage.html
Consumer Products	Consumer Product Safety Commission (CPSC): http://www.cpsc.gov
Mineralogy	United States Geological Survey (USGS): http://minerals.usgs.gov/minerals/

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Last updated on Friday, June 13th, 2003
URL: <http://www.epa.gov/opptintr/asbestos/insulation.html>